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Abstract: Problem statement: Private giving and government funding are critical revenue sources for public colleges and universities. If increased private giving reduces government funding, then that type and extent of crowding out carries important managerial and public policy implications. **Approach:** The study used a government funding reaction function and an instrumental variable approach to empirically estimate the potential for crowding out. **Results:** The study examined the extent to which private giving reduces or crowds out state government funding of public colleges and universities. Government free riding was at question and investigated to determine how active it is in terms of private donations partially or wholly displacing state government funding. The findings suggested that the rate of crowding out was 43% on the dollar. That compares to the 45% political substitution of the 1960's but is much diminished from the 1980's dollar for dollar crowding out. Those are aggregate comparisons for all public institutions. A disaggregated approach in this study additionally revealed that doctoral universities were victims of the same 43% crowd out but that at two other levels, master degree granting and associate degree granting colleges, there was the opposite effect of crowding in. Those colleges received state funding augmentations of 32-92% on their dollar of privately provided donations. **Conclusion/Recommendations:** The study's finding of the existence of both crowding out and crowding in can carry important policy implications for college and university funding. Future managerial and public policy decision making should take that into account. However, political sustainability and economy wide and localized effects over time of crowding out and in could prove fruitful avenues of inquiry for future research.

Key words: Education finance, private giving, crowding out

INTRODUCTION

This study examines the extent to which private giving reduces or crowds out state government funding of public colleges and universities. It is based on the notion that private support of public higher education can give rise to a reaction whereby state politicians and bureaucrats reallocate available tax dollars away from education toward self promoting pursuits. For public higher education in the United States, this form of government free riding has been empirically examined twice. Peltzman (1973) found that during the mid 1960's it existed in the form of partial crowding out on the order of a 45% reduction in state funding per dollar of university funds raised through private donations. In the work of Becker and Lindsay (1994) it increased in the mid 1980's to complete or dollar-for-dollar crowding out.

Indeed, it is puzzling that two more decades have passed with the absence of this attention to public higher education, especially given the movement from partial to complete crowd out. Needless to say, the lay literature abounds with articles reporting the continuing financial changes taking place in higher education. State universities and colleges have been devoting greater internal resources to fundraising in pursuit of private donations. New competition with the traditional flagship universities has arisen as even two-year postsecondary institutions are now full force in the private fund raising business. Local governments have been approached and responded to funding efforts. At the same time, colleges and universities have experienced reductions in state government funding.

In this context, questions arise as to the current relationship between public higher education private fund raising and state government support. Is complete crowding out sustainable? Even partial crowd out with enhanced private giving will exacerbate declines in state provided revenues. If governments do react differently over time, then it is important to explore those changes and determine whether or not funding displacement continues to prevail.

This study attempts to do so by moving forward toward the present and using the most recently deployed financial data for public colleges and universities. Changes in financial reporting

requirements incorporated into the data roll over to improvements in the empirical work at hand. Alongside the much needed updates, a major contribution is offered in providing disaggregated estimates of crowding out. In addition to aggregate estimates as provided in the two previous studies, institutions are disaggregated according to Carnegie classifications and potential crowding out is examined across four levels: Doctoral, master, bachelor and two year degree granting colleges and universities. The fiscal year 2006 results for 1200 institutions indicates a return to partial crowding out for the aggregate of those institutions and among doctoral universities as a separate group. In contrast, there appears matching funding behavior on the part of state governments that actually produces crowding in among master and associate degree granting public colleges and universities.

Background: Development of the general relationship between private and government funding of public goods has hinged on the assumption that individuals receive utility from private good consumption and the total of support to a public good (Bergstrom *et al*., 1986). As extensions, the latter has been separated into present and past private donor behavior (Andreoni, 1990). For a pure public good, government and private sources are perfect substitutes, one completely crowding out the other. If donors are motivated purely by the act of giving or a warm glow, then individual contributions transform to a private good (Rose-Ackerman, 1982) and zero crowding out occurs. Bases of partial crowd out are necessarily more diverse and, e.g., have theoretically incorporated donor-recipient utility interdependence (Abrams and Schmitz, 1978).

One thread of empirical studies concentrates on investigating the extent to which increased government expenditures displace private giving. The evidence is mixed. Often cited are the Abrams and Schmitz (1978) crowding out parameter of -0.28 in which a dollar of government expenditures on an aggregate of welfare programs reduces private charity by 28%. Kingma (1989), arguing that reliable estimates require use of specific rather than aggregate public goods, finds half (-0.135) that level of crowd out in public radio. Manzoor and Straub (2005) re-examination of public radio find that it could be five times that magnitude. In other studies, there are reports of complete (Roberts, 1984) crowding out. Recently, interest in the possibility of the reverse effect of crowding in has arisen and, at research universities, Payne (2001) finds a 65% increase in private research donations per dollar of increased federal research support.

An alternative focus has rested upon the opposite notion that private giving crowds out government support. There are two major research pieces that take this line of inquiry. Both centers on higher education (other studies have scrutinized higher education under the crowding out proposition, but in the much narrower context of internal resource allocations and the fungibility of institutional dollars. Ehrenberg *et al*. (1993) found that federal funding of graduate education partially crowded out internal funding in doctoral granting universities. Connolly (1997) found that external government research funding caused an increase in internal research support. That crowding in is also a finding of Payne (2001) but it is increased private rather than government research giving that increases externally provided federal research support at research universities). First is Peltzman (1973) seminal work on in-kind subsidies. He posits that the demand for public higher education is tied to the political process and that increased private expenditures generate a "political substitution" effect whereby legislators react by reducing government funding. Employing aggregate state level data for 1967, his estimated per dollar "coefficient of political substitution" is -0.45.

Second and within the same framework, Becker and Lindsay (1994) contend that self-interested governments free ride on private giving. Subject to legal or obligated funding constraints, government agents pursue their own utility, including vote maximization, at the expense of attending to allocative efficiencies. Increased private provision of a public good tends to weaken constraints, inducing a government reallocation reaction and subsequent expenditure reduction. Using institutional level data for public colleges and universities, their mid 1980's crowding out parameter of -1.07 is a combined state and local government funding reduction per dollar of institutional funding received from private donors. Not significantly different from unity, they conclude that private giving results in dollar-for-dollar crowd out.

The two studies suggest a movement from partial to complete crowding out that raise questions as to the current relationship between private charity and fund raising efforts on the part of institutions of higher education. The remainder of this study turns to that relationship at it currently pertains to public colleges and universities (Both Peltzman (1973) and Becker and Lindsay (1994) do provide separate group estimates for public and private schools but find the absence of any significant relationship between government support and private donations among the latter. It is admitted that the lack of any correlation is likely due to the very small state funding presence in the private sector).

MATERIALS AND METHODS

Our specific interest lies with a government reaction function whereby state funding of a public college or university is determined and affected by specific outputs, performance measures and characteristics, but also the level of private donor funding. Following the works of Peltzman (1973) and Becker and Lindsay (1994), the general reaction function can be expressed as follows:

$$\text{STATEFUND} = \alpha_0 + \sum_i \alpha_i X_i + \beta \text{PGIVING} + \varepsilon \qquad (1)$$

where, STATEFUND is the annual dollar amount that the institution receives from the state government and depends upon a set of institutional outputs and attributes, X and the annual funding received through private giving, PGIVING.

In part, state funding is legislated and tied to specific institutional outputs and, in part, it flows from discretionary pots of monies available for allocation and subject to political influence. In all cases, state appropriations are a function of college and university teaching output as usually measured by student enrollments or credit hour production. But state funding is also influenced by some loose performance measures that are expected outputs of public colleges and universities, including research and public service output. There are also institutional characteristics, e.g., auxiliary facilities like sports arenas and student dormitories, which potentially appeal to or manipulate the state political machinery.

Private giving is largely the result of fund raising efforts, both present and past, of individual colleges and universities. Those efforts make potentially new and past private donors aware of the educational outputs, accomplishments and needs of the institution and offer to them that warm glow that they would enjoy from being contributors. The process is intended to create a permanent donor base and to continuously expand upon it. Thus it is likely that both current private giving and, therefore, state funding are influenced by past giving (Andreoni and Payne, 2003; Becker and Lindsay, 1994). Hence, for empirical estimation of the reaction equation, ordinary least squares are not appropriate. As with Peltzman (1973) and Becker and Lindsay (1994) we employ instrumental variables and in the reaction function use predicted private giving as recovered from:

$$\text{PGIVING} = \delta_0 + \sum_i \delta_i X_i + \gamma \text{ENDOW} + \varepsilon \qquad (2)$$

where, past or lagged private donor funding is proxied by accumulated wealth in the form of institutional endowment, ENDOW.

Upon estimation, whether or not and to what extent there exists a displacement of private for state funding is determined by the crowding out parameter, β. In particular, crowding out can be absent ($\beta = 0$), partial ($-1<\beta<0$), or complete, if not super, ($\beta \leq -1$). Of course, there are special state government programs whereby college and university privately raised dollars are partially or even more than dollar for dollar matched by state funds. In that event, there could be the overall effect of crowding in ($\beta>0$).

If it is possible for the private provision of public higher education to cause state governments to react with funding changes, then it also seems plausible that the same state governments would react to other funding sources, viz., that provided by other governments. Becker and Lindsay (1994) empirically investigated this notion through the effect of federal contributions in the reaction function. Presently, we will likewise extend our inquiry in this direction, but amend the methodology to include local, in addition to state government funding. Thus, it is contended that, when feasible, state governments would also free ride on local and federal government contributions.

Our two previous empirical estimates examined crowding out for the aggregate of all public colleges and universities. That ignores the fact that there are homogeneous institutional groups chartered for specific public goods needs that might tend to attract like political and donor support. The so-called flagship research universities differ from the two year (junior or community college) degree granting institutions. All are publicly supported and all are engaged in the private fund raising game, but they have different missions and during their fund raising drives they peddle different goods. In order to capture such differences, our empirical work will segment the industry by the Carnegie Classification Code and investigate crowding out in the aggregate and disaggregated according to four institutional levels: doctoral, master, bachelor and associate degree granting institutions.

Data: Data for individual colleges and universities are drawn from the US Department of Education; National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS) (in 1988, IPEDS replaced the former National Center for Education Statistics data used by Becker and Lindsay (1994). IPEDS requires separate reporting by all colleges and universities where as previously data were combined for parent and child institutions, i.e., main campus data was combined with all branch campuses. If the latter receive differential private or state funding,

then the Becker and Lindsay (1994) estimates would be biased. Using IPEDS that problem is currently avoided. Also, Becker and Lindsay (1994) arbitrarily eliminated colleges receiving less than $50,000 in private support. Here, we include such institutions). There is considerable annual lag in the assembly and release of final data sets. The most recently available is for the fiscal year 2006 and is used here. The finance, institutional characteristics and enrollment surveys from IPEDS are combined to produce a useable data set of 1, 210 public universities and colleges, Here that is subset by doctoral granting universities (147) and master (247), bachelor (54) and two year associate degree granting colleges (762) (The Carnegie Classification Codes have undergone changes over time but here doctoral combines the two levels of Carnegie Doctoral/Research Universities, master combines both the Carnegie Master's Colleges and Universities I and II levels, bachelor combines both Baccalaureate Colleges-Liberal Arts and-General levels and associate is a combination of Baccalaureate/Associate's Colleges and Associate's Colleges. The eight classifications are collapsed into four levels based on the fact that, for the purposes at hand, the very slight differences in missions cannot be reasonably quantified).

IPEDS is used to derive institutional revenues from sources pertaining to State Funding (STATEFUND), Private Giving (PGIVING), Local funding (LOCAL) and Federal funding (FED). In attempting to link state funding to teaching output we recognize that not all teaching is treated equally in state funding formulas or given equal treatment in discretionary funding. Also, different teaching has different visibility that can shape private giving. IPEDS allows us to include teaching variability according to three outputs, Undergraduate (UGRAD), Professional (PROF) and Graduate (GRAD) teaching. Each is measured as full time equivalent enrollments. Medical school enrollments are not available, but the schools are highly visible, produce external community benefits and one would think they are usually productive in creating special government and private support. Thus, we include a dummy variable for the presence of a Medical school (MED). With reluctance but believed to be out of necessity, to control for possible remnants of any racial discrimination in educational funding on either funding side, the Percentage of student enrollment that is Black (PBLACK) is incorporated as a funding determinant.

Research and service, the other large portions of college and university production and presumably affecting government support and valued by private donors, are more controversial in measuring. Like others (Cohen *et al*., 1989) it will be necessary to assume that the available financial data on institutional expenditures correlate with production. From IPEDS, the proxies are, therefore, annual Research (RES) and public Service (SER) expenditures.

The campus auxiliary facilities serve a variety of constituents whether they are sports arenas, entertainment complexes, food services, or dormitories. They are either directly or indirectly subsidized through state funding mechanisms and a plethora of fund raising undertakings are attached to them. As with research and service, the best inter-institutional measure available is the annual expenditures on Auxiliary enterprises (AUX).

RESULTS AND DISCUSSION

Table 1 contains a summary of the variables along with their means and standard deviations for all 1,210 institutions combined and separately for each of the four levels. As expected, doctoral universities, even though comprising less than 4% of the institutions, command 85% of private giving. Lower level institutions on average gather smaller private donations in the both the present and during the past and also receive less state support. But the associate degree granting colleges produce more undergraduate education on average than either the master or bachelor level institutions. At the undergraduate level, the associates actually serve 60% of the student population.

Table 1: Variable means and standard deviations by institutional level

Variable	Description	All	Doctoral	Master	Bachelor	Associate
STATEFUND	State government funding, $	40.0 (68.5)	171.9 (122.5)	44.8 (30.2)	15.3 (10.4)	14.8 (14.60)
PGIVING	Private giving, $	3.1 (12.8)	21.5 (31.0)	1.3 (1.8)	0.7 (1.9)	0.3 (1.1)
UGRAD	Undergraduate FTE	11273 (9996)	19648 (9024)	9345 (5999)	3933 (2406)	10802 (10596)
PROF	Professional FTE	87 (381)	668 (883.0)	-	-	-
GRAD	Graduate FTE	1205 (2500)	6167 (3442)	2177 (1812)	-	-
PBLACK	Percent black enrollment	13.7 (18.0)	10.7 (15.8)	15.8 (23.5)	16.1 (25.7)	13.4 (15.5)
MED	Medical school (if so = 1)	-	0.4	-	-	-
RES	Research expenditures, $	14.4 (5.9)	113.0 (134.0)	2.9 (5.0)	0.7 (1.2)	0.02 (8.2)
SER	Public service expenditures, $	6.1 (2.2)	39.2 (50.4)	3.8 (5.3)	1.6 (2.0)	0.8 (1.7)
AUX	Auxiliary enterprises, $	12.6 (2.9)	66.2 (58.1)	13.3 (11.1)	6.0 (4.9)	2.5 (3.1)
LOCAL	Local government funding, $	10.0 (2.2)	31.2 (46.6)	1.9 (4.4)	0.8 (1.5)	9.3 (15.3)
FED	Federal government funding, $	19.6 (5.9)	114.5 (136.0)	10.8 (10.3)	5.0 (5.0)	5.2 (5.7)
ENDOW	Institution endowment, $	38.6 (2.1)	275.6 (543.2)	16.5 (24.0)	9.5 (39.0)	2.3 (6.3)
N	Observations	1210	147	247	54	762

Note: For presentation, all dollars are presented in millions; FTE: Full Time Equivalent

Table 2: Private giving estimates by institutional level

Variable	All	Doctoral	Master	Bachelor	Associate
INTERCEPT	81979 (302990)	365592 (3861106)	-135034 (228514)	13319415 (2148)	87099 (63948.000)
UGRAD	100.80* (22.72)	-252.41** (253.73)	76.59* (27.32)	89.32* (36.99)	20.52* (5.260)
PROF	1169.72 (835.23)	4896.55 (2646.82)	-	-	-
GRAD	-324.64* (113.61)	607.09 (673.15)	-68.88 (74.09)	-	-
PBLACK	-737940 (968867)	-2264728 (9103219)	-128083 (484479)	647128** (339045)	258903 (241960)
MED	-4143084* (102363)	-7076060** (3705092)	-	-	-
RES	0.196* (0.013)	0.301* (0.047)	0.0590* (0.0240)	0.056 (0.082)	0.0450 (0.4470)
SER	0.243* (0.013)	0.022 (0.036)	0.0060 (0.0220)	0.06 (0.055)	0.0110 (0.0230)
AUX	0.073* (0.010)	0.083* (0.033)	0.035* (0.0100)	-0.004 (0.018)	-0.0030 (0.0130)
LOCAL	-0.109* (0.013)	-0.313* (0.062)	-0.050* (0.0240)	-0.146* (0.052)	-0.006** (0.003)
FED	-0.022** (0.012)	-0.076** (0.039)	-0.0150 (0.0150)	-0.063* (0.021)	-0.013** (0.008)
ENDOW	0.011* (0.001)	0.009* (0.004)	0.030* (0.0040)	0.046* (0.002)	0.030* (0.006)
F	393.99*	35.05*	12.81*0	86.01*	7.66*
Adj R^2	0.781	0.72	0.3020	0.928	0.650
N	1210	147	247	54	762

Note: Standard errors in parentheses; *: Significance at the 5% level or better; **: Significance at the 10% level or better

Table 3: State funding estimates by institutional level

Variable	All	Doctoral	Master	Bachelor	Associate
INTERCEPT	3002338* (1529192)	7002155 (19093266)	2168199 (2474255)	1533376 (1881521)	327722.000 (787919)
UGRAD	1737.68* (125.35)	1445.78 (137970)	2989.25* (340.68)	2264.55* (450.9)	1019.06* (90.22)
PROF	24001.79* (4394.08)	31679.81** (17222.81)	-	-	-
GRAD	6458.68* (602.58)	6029.51** (3657.29)	2025.97* (827.51)	-	-
PBLACK	37160 (49273)	-63657 (451541)	29975 (53081)	177210* (42056)	-3990 (28385)
MED	-5072463 (5862669)	-5904956 (23672360)	-	-	-
RES	1.474* (0.121)	1.708* (0.585)	0.284 (0.288)	-0.038 (1.013)	10.903* (5.200)
SER	0.952 (0.066)	0.623 (0.184)	-0.584* (0.246)	0.519 (0.678)	0.054 (0.275)
AUX	0.795* (0.069)	0.818* (0.237)	0.136 (0.033)	0.761* (0.218)	0.267** (0.160)
LOCAL	-0.627* (0.092)	-0.893 (0.678)	-0.450** (0.276)	0.254 (0.648)	-0.302* (0.042)
FED	-0.246* (0.059)	-0.430* (0.202)	0.587** (0.163)	-0.654* (0.253)	0.533* (0.102)
PGIVING	-0.434* (0.056)	-0.427* (0.187)	0.318* (0.173)	-0.387 (0.524)	0.921* (0.2430)
F	510.20*	25.82*	65.25*	12.59*	113.38*
Adj R^2	0.822	0.661	0.71	0.643	0.591
N	1210	147	247	54	762

Note: Standard errors in parentheses; *: Significance at the 5% level or better; **: Significance at the 10% level or better

Table 2 and 3 present the regression results for the first and second stages respectively (in each case, Hausman' specification test was employed to determine if the instrumental variables method was preferred to the more efficient ordinary least squares. In all cases except the bachelor level group, the ordinary least squares method was found to be an inconsistent estimator at the 1% and better level of significance. The ordinary least squares estimates for the bachelor level institutions, however, did not seem to warrant panic nor a replacement of the instrumental variables estimates, especially given the small presence of bachelor degree granting colleges group in the public sector and our analysis. The gain in R^2 was less than 1% and the private giving coefficient only changed from a negative 0.387-0.351). Turning to the main thrust of the inquiry, the empirical estimates provided in Table 3 support the proposition that among publicly controlled state colleges and universities, state government funding responds to private provision. When government reaction to private giving is based on the aggregation of All (All) institutions, there is partial crowding out to the extent of a 43% reduction in government funding per dollar of private fund raising. The two prior empirical studies are based on that kind of aggregation and, thus, the current 43% compares to Peltzman's 45% political substitution during the 1960's, down considerably from Becker and Lindsay's complete 1980's dollar-for-dollar crowding out.

Yet unlike both those studies, the disaggregation approach undertaken here appears to be fruitful in uncovering quite a different crowding picture across different institutional levels. The results reveal an unbalanced government reaction. Crowding out as it pertains to the estimated PGIVING coefficient only exists within two of the four institutional levels, doctoral universities and bachelor degree granting colleges. The state-private 43% displacement at doctoral universities far exceeds the 4% for bachelor degree colleges, but the latter is statistically insignificant. The doctoral effects tend to have an overwhelming power in influencing the aggregate (All) estimates. That derives from the observed reactions in the other two levels where state government support responds positively to private charity. In both master level and associate level colleges, state governments

match successful private fund raising efforts: approximately 32 and 92% on the dollar, respectively. This crowding in is apparently buried in the aggregate "All" estimates provided here and therefore quite likely, in the two previous studies. That there does exist political complementarity is encouraging, especially in defense of successful college and university fund raising.

From the state government reaction estimates, there emerges evidence of free riding on other government funding. In the aggregate and across all institutional levels, Federal dollars (FED) substitutes for state dollars in the funding behavior of state decision makers. It varies from 25% displacement in the aggregate of all institutions to 65% for the small group of bachelor degree granting colleges. And while the funding stakes are generally smaller at the Local (LOCAL) government level, there is significant per dollar crowd out evident in the aggregate, but when disaggregated it appears only at the master and associate level institutions. Still, those two combined make up more than 80% of publicly controlled higher education institutions. Of the remaining determinants of state funding decisions, the majority of results are as expected. In practice, state funding related to teaching output is almost universally formula driven and that is borne out here with respect to UGRAD, PROF and GRAD. It is comforting that we can reject any significant presence of racial discrimination (PBLACK) in the state mechanism. In fact, there are rewards for student diversity and significantly so at bachelor level institutions. Against expectation, the MED coefficient is negative but without statistically significant effects. It's suspected that they are institutions in themselves and their autonomy is not captured in the financial data via IPEDS. With only two exceptions, research and service output along with auxiliary enterprises carry positive funding impacts, but as would be further expected with varying degrees across college and university levels.

Returning to the instrumental variable estimates of Table 2, the results on private giving are equally interesting even though the overall explanatory abilities are weaker, especially so in the master level group of colleges. But it is true here that college and university private fund raising is more lucrative the larger the past donor base (ENDOW). However, according to our estimates, private donors do react negatively to Local (LOCAL) and Federal (FED) government support. Aside from the weaker results in the master level colleges, that crowding out is everywhere present. All in all, the results with respect to individual determinants are in line with that given above for state funding. Private donors also elect government decision makers. Hence, the funding reactions should and do parallel one another.

CONCLUSION

Based on this research, government free riding appears to be alive and well and implies that private fund raising in public higher education partially crowds out state government funding at the rate of 43% on the dollar. That is based on an aggregate of some 1,200 colleges and universities in 2006. It is on the same order as Peltzman's 1960 political substitution of 45% but considerably diminished in comparison to Becker and Lindsay's 1980 dollar-for-dollar crowding out.

The present finding of crowding out decline is by itself significant for the revenue implications of successful private fund raising on the part of public colleges and universities. However, the current research is believed to offer even wider contributions.

Unlike the two previous works, the current study expands upon the methodology and examines the crowding out proposition by disaggregating public higher education institutions according to their Carnegie Classification Code. The relationship between state and private support is investigated separately for doctoral, master, bachelor and associate degree granting colleges and universities. That unbundling proved to be empirically productive in revealing that state government reaction to private giving is substantially different among different institutional levels. Powerful partial crowding out on the order of 43% is found to persist among doctoral universities. But in contrast, the opposite effect actually prevails in the master and associate level colleges and universities. Their private fund raising dollars are rewarded with additional state funding on the order of 32% and 92%, respectively. The two groups combined comprise 83% of the public institutions and serve 77% of the undergraduate student population. In that sense, the funding complementarity disclosed herein weighs favorably for the future financial well being of a large segment of public higher education.

But there are some cautions in order. They rest first on the additional finding and in support of previous work that state governments react to other government funding and tend to free ride on local and federal support of their publicly controlled colleges and universities. Second, there remains the question of political sustainability over time of any free riding, crowding out, or now crowding in. And third whether or not any of these funding reactions are subject to economy wide, regional, or localized economy effects, have not been rigorously addressed here or elsewhere.

Additional research along all these lines would certainly be desirable.

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